MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2019/2020

PTM0145 – TRIGONOMETRY

(Foundation in Information Technology / Life Sciences)

7 MARCH 2020
9.00 a.m. – 11.00 a.m.
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This question paper consists of **TWO** pages excluding the cover page and the Appendix.
2. Answer **ALL FIVE** questions. All questions carry equal marks and the distribution of the marks for each question is given.
3. Please write all your answers in the Answer Booklet provided.
4. All necessary working steps **MUST** be shown.

Question 1 **[10 marks]**

a. Given $z_1 = 1 - i$ and $z_2 = 3 + 4i$. Find $z_1 z_2$ and $\frac{z_1}{z_2}$. Leave your answer in the standard form $a + bi$. (5 marks)

b. Convert the complex number $z = -2 + 3i$ to the polar form. Hence, compute z^6 using De Moivre Theorem and leave your answer in the polar form. (5 marks)

Question 2 **[10 marks]**

a. Find the vertex, the focus and the directrix of the parabola with the equation $y^2 - 2y + 12x - 35 = 0$. Sketch the graph of the parabola. (6 marks)

b. Find the equation of an ellipse whose foci are at $(-1,0)$ and $(3,0)$, and the length of its minor axis is 2. (4 marks)

Question 3 **[10 marks]**

a. If $\sin\alpha = \frac{4}{5}$ where $0 < \alpha < \frac{\pi}{2}$ and $\cos\beta = -\frac{12}{13}$ where $\frac{\pi}{2} < \beta < \pi$, find

i. $\cos(\beta - \alpha)$ (3 marks)

ii. $\sin 2\beta$ (2 marks)

b. Solve the following equation for $0 \le x \le 2\pi$:

i. $4\cos^2 x - 4\cos x + 1 = 0$ (2 marks)

ii. $\cos 2x + \sin x = 0$ (3 marks)

Question 4 **[10 marks]**

a. Establish the identity $\tan x + \cot x = \sec x \csc x$. (3 marks)

b. Solve the triangle given that $a = 10$, $b = 8$ and $c = 16$. Then the area of the triangle ABC. (7 marks)

Continued…

Question 5 [10 marks]

Find the inverse of $\begin{bmatrix} 1 & -6 & 3 \\ 2 & -7 & 3 \\ 4 & -12 & 5 \end{bmatrix}$. Hence, solve the following linear system using the inverse method.

$$\begin{aligned} x-6y+3z &= 11 \\ 2x-7y+3z &= 14 \\ 4x-12y+5z &= 25 \end{aligned}$$

(10 marks)

End of Paper

APPENDIX

Trigonometry Identities

$\cos^2 A + \sin^2 A = 1 \qquad \sec^2 A = 1 + \tan^2 A \qquad \csc^2 A = 1 + \cot^2 A$

$$\cos(A+B) = \cos A\cos B - \sin A\sin B$$
$$\cos(A-B) = \cos A\cos B + \sin A\sin B$$
$$\sin(A+B) = \sin A\cos B + \cos A\sin B$$
$$\sin(A-B) = \sin A\cos B - \cos A\sin B$$
$$\tan(A+B) = \frac{\tan A + \tan B}{1 - \tan A\tan B}$$
$$\tan(A-B) = \frac{\tan A - \tan B}{1 + \tan A\tan B}$$

$$\cos 2A = \cos^2 A - \sin^2 A$$
$$= 2\cos^2 A - 1 = 1 - 2\sin^2 A$$
$$\sin 2A = 2\sin A\cos A$$
$$\tan 2A = \frac{2\tan A}{1 - \tan^2 A}$$

$$\sin A\cos B = \frac{1}{2}\left[\sin(A+B) + \sin(A-B)\right]$$
$$\cos A\cos B = \frac{1}{2}\left[\cos(A+B) + \cos(A-B)\right]$$
$$\sin A\sin B = \frac{1}{2}\left[\cos(A-B) - \cos(A+B)\right]$$

$$\sin A + \sin B = 2\sin\frac{A+B}{2}\cos\frac{A-B}{2} \qquad \sin A - \sin B = 2\cos\frac{A+B}{2}\sin\frac{A-B}{2}$$

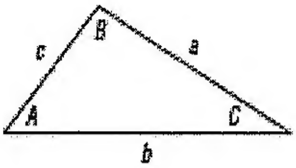
$$\cos A + \cos B = 2\cos\frac{A+B}{2}\cos\frac{A-B}{2} \qquad \cos A - \cos B = -2\sin\frac{A+B}{2}\sin\frac{A-B}{2}$$

$$\sin^2\frac{A}{2} = \frac{1-\cos A}{2} \qquad \cos^2\frac{A}{2} = \frac{1+\cos A}{2} \qquad \tan^2\frac{A}{2} = \frac{1-\cos A}{1+\cos A}$$

$$\sin\frac{A}{2} = \pm\sqrt{\frac{1-\cos A}{2}} \qquad \cos\frac{A}{2} = \pm\sqrt{\frac{1+\cos A}{2}} \qquad \tan\frac{A}{2} = \pm\sqrt{\frac{1-\cos A}{1+\cos A}}$$

$$\tan\frac{A}{2} = \frac{1-\cos A}{\sin A} = \frac{\sin A}{1+\cos A}$$

Triangles



Law of Sines:

$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$

Law of Cosines:

$$c^2 = a^2 + b^2 - 2ab\cos C$$
$$b^2 = a^2 + c^2 - 2ac\cos B$$
$$a^2 = b^2 + c^2 - 2bc\cos A$$

Area of a Triangle: $A = \frac{1}{2}ab\sin C = \frac{1}{2}bc\sin A = \frac{1}{2}ac\sin B$

$A = \sqrt{s(s-a)(s-b)(s-c)}$ where $s = \frac{1}{2}(a+b+c)$

Polar Coordinates

$$x = r\cos\theta$$
$$y = r\sin\theta$$
$$r = \sqrt{x^2 + y^2}$$
$$\tan\theta = \frac{y}{x}$$